DBS Series

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DC Brushless Motor Driver User's Manual

Made by TROY Enterprise Co., Ltd

Management System
ISO 9001:2008
ISO 14001:2004
TÜVRheinland CERTIFIED
www.tuv.com ID 0910099275

Environment Responsibility

- TROY is always committed to environment protection. All packaging material is recyclable and reusable.
- If disposing of used product, please recycle by type as per waste disposal procedures.

----------Protect the green earth with your care and commitment----------

Precautions

Precautions for using

1.Thank you for purchasing TROY products. Please read this user's manual thoroughly before installing and operating the Driver, and always keep the manual where it is readily available.

2. The products described in this manual has been designed and manufactured for use in industrial machinery, and must not be used for any other purpose. We are not responsible for any damage caused through failure to observe this warning.

3.Check that the Motor, Driver and any accessories are all present. If an accessory is missing or damaged, contact the nearest our branches.

4.Never disassemble the Motor and Driver. Damage or performance impairment may result. Disassembly voids all warranties.

Precautions for maintenance

Check the ambient environments, clean the system equipment to remove dust and tighten the screws periodically. Also pay attention to the followings.

1. Contact us when repairs become necessary.
2. Since the temperature of the frame of the Driver can rise high, be careful when conducting maintenance work or inspection work.

Precautions for warranty period

Within the period of one year after delivery of the system equipment, when failures occurring from design error or fabrication error attributable to the manufacture side occur, we will be repairing the failure free of charge within the reparable range or will replace with substitute. (We cannot hold ourselves responsible for breakage and accidents occurring from your use beyond the specified range described in this document.)

Precautions for disposal

When disposing of the Driver and the Motor, treat them as ordinary industrial waste.

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1.Specifictions

1.1Specs

Motor output		20W	40W	60W	100W
Round shaft		6B020S-D	6B040S-D	9B060S-D	9B100S-D
Pinion shaft		6B020P-D	6B040P-D	9B060PD-D	9B100PD-D
Input power	Voltage	DC24V±10%			
	Current	>2A	>4A	>6A	>10A
	Rated current	1.48A	3.65A	4.37A	6.73A
Starting torque（Kgcm/Nm） Rated torque (Kgcm/Nm)		0.8 / 0.08 0.65 / 0.065	1.6 / 0.16 1.4 / 0.14	2.5 / 0.25 2 / 0.2	4 / 0.4 3.3 / 0.33
Permissible inertia(GD^2)		4.904kgcm^2	9.799kgcm^2	11.576kgcm^2	21.316kgcm^2
Speed regulation		250~3000 RPM			
Speed variation	To load	-2% (At 3000 RPM, within no load ~rated load)			
	To voltage	±2% (Power voltage variation DC24V±10% at 3000 RPM)			
	To temp.	±3% (0~+50℃,at 3000 RPM with no load)			
Speed control		•External speed potentiometer(Accessories: variable resistor 20KΩ) •Internal speed potentiometer (Internal/external speed setting selectable) •Controlled by DC voltage(DC0~5V/1mA)			
Input signal		Photocoupler input interface •Run/stop, brake, clockwise/ counter clockwise, internal/external speed setting switch •Alarm release input			
Signal output		Open collector output interface •Speed signal output, Alarm output			
Functions		•Input/output signal contact can connect to the programmable controller(PLC)I/O contact •Speed range 250~3000RPM,Motor output rated torque			
Protection functions		•Over load, low voltage, Cable broken: Motor stop and「ALARM」red light lit up •Power against connection, over voltage: Internal fuse is open circuit then it will back to normal when power OFF then input			

1.2 Specs of Motor/Driver

Item		Driver	Motor
Insulating resistance		When tested with DC500V high resistance meter, the resistance between power, F.G ground, and I/O contact terminal is over 100MΩ.	When tested with DC500V high resistance meter, the resistance between wires and Motor case is over 100MΩ.
Insulating voltage resistance		No abnormal symptoms when supplying AC 0.5V/60Hz voltage between the power input terminal and the machine case for one minute.	No abnormal condition when supplying 1.8KV/60Hz voltage continued 1 sec.
Ambient （During operation）	Temperature	0~40℃	0~50℃
	Humidity	Within 85%	
	Atmosphere	No corrosive gases, dust and flammable gas	

2. Verfiying the combination

Upon opening the package, verify that the items listed below are included then install, wring and operating. If there is any problem please contact our branch.

2.1 Verifying the content of package

Round type/Pinion type ※Note: The pinion type has to attached with「GEARHEAD」then it can install

Item	Quantity
Driver	1
Mounting plate(Flat screwsx4pcs)	1
Speed potentiometer	1
Signal insulated cable(For speed potentiometer)	1
Connector 11 pins	1
Connector 2 pins	1
User's manual	1
Motor	1

2.2 Verifying the product name and spec

●If you purchased is the 「Round type」please check the combination as below:

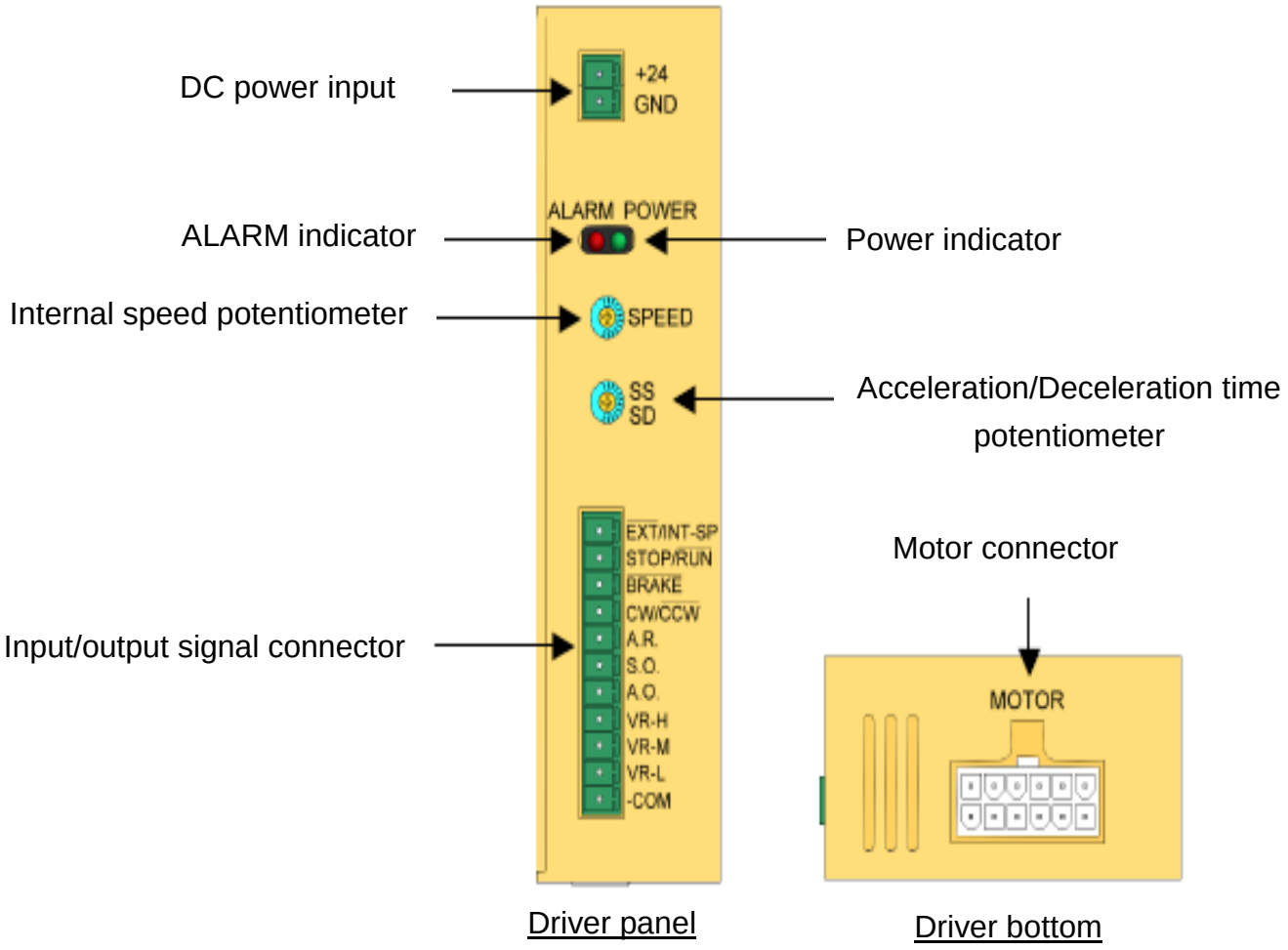
Power	Voltage spec	Motor model	Driver model
20W	DC23~26V	6B020S-D	DBD020-D
40W		6B040S-D	DBD040-D
60W		9B060S-D	DBD060-D
100W		9B100S-D	DBD100-D

●If you purchased is the 「Pinion type」please check the combination as below:

Power	Voltage spec	Motor model	Driver model	Name of Gearhead
20W	DC23~26V	6B020P-D	DBD020-D	6D☐
40W		6B040P-D	DBD040-D	6D☐
60W		9B060PD-D	DBD060-D	9D☐
100W		9B100PD-D	DBD100-D	9D☐

※Note: If you purchased is the 「Pinion type」please attach with the 「GEARHEAD」

3.Function of Driver parts



<table>
<tr><td>Item</td><td colspan="4">Functions</td></tr>
<tr><td>Motor connector</td><td colspan="4">Please insert the Motor cable</td></tr>
<tr><td>DC power input connector</td><td colspan="4">Please input the power voltage DC24V±10%according to the specs of Driver
「+24」contact: Please connect to the DC power 「＋」terminal
「GND「 contact: Please connect to the DC power 「－」terminal</td></tr>
<tr><td>Power indicator</td><td colspan="4">When DC power is on, the 「POWER」green light on the front panel will lit up</td></tr>
<tr><td>ALARM indicator</td><td colspan="4">The protection function activated, Motor will stop and the 「ALARM」red light lit up,「A.O.」contact output signal during Motor over load/ Driver low voltage /cable broken</td></tr>
<tr><td>Internal speed potentiometer</td><td colspan="4">Operation speed setting, speed regulation range0~3000RPM</td></tr>
<tr><td>Acceleration/Deceleration time potentiometer</td><td colspan="4">SS(Slow-start)Acceleration time max 10 sec(0~3000RPM within no load）※1
SD(Slow-down)Deceleration time max 5 sec(3000RPM~0RPM within no load)</td></tr>
<tr><td rowspan="8">Input/output signal connector</td><td>No.</td><td>Terminal name</td><td>Name of functions</td><td>Functions</td></tr>
<tr><td>1</td><td>$\overline{\text{EXT}}$/INT - SP</td><td>Internal/external speed setting switch</td><td>Input signal level「L」→External speed setting※2
「H」→Internal speed setting</td></tr>
<tr><td>2</td><td>STOP/$\overline{\text{RUN}}$</td><td>Stop/Start</td><td>Input signal level「L」→Start「H」→Stop</td></tr>
<tr><td>3</td><td>$\overline{\text{BRAKE}}$</td><td>Instantaneous stop</td><td>Input signal level「L」→Brake stop 「H」→Natural stop</td></tr>
<tr><td>4</td><td>CW/$\overline{\text{CCW}}$</td><td>Clockwise/Counterclockwise rotation</td><td>Input signal level「L」→Counterclockwise rotation 「H」→Clockwise rotation</td></tr>
<tr><td>5</td><td>A.R.</td><td>ALARM release</td><td>Alarm reset, input「Negative trigger signal」→ALARM release</td></tr>
<tr><td>6</td><td>S.O.</td><td>Operation speed signal</td><td>Used when monitoring the rate of rotation, pulse signals output 12Pulse/ rotation</td></tr>
<tr><td>7</td><td>A.O.</td><td>ALARM signal</td><td>The signal is output when Motor overload/Driver low voltage/cable broken and Motor will stop naturally※3</td></tr>
</table>

Item	Functions			
Output/input signal connector	8-10	VR-H/M/L	External speed potentiometer	Setting Motor speed by connected speed potentiometer or DC voltage(0~5V)
	11	-COM	Ground for controlling	Common control signal ground for input/output and external DC power GND contact

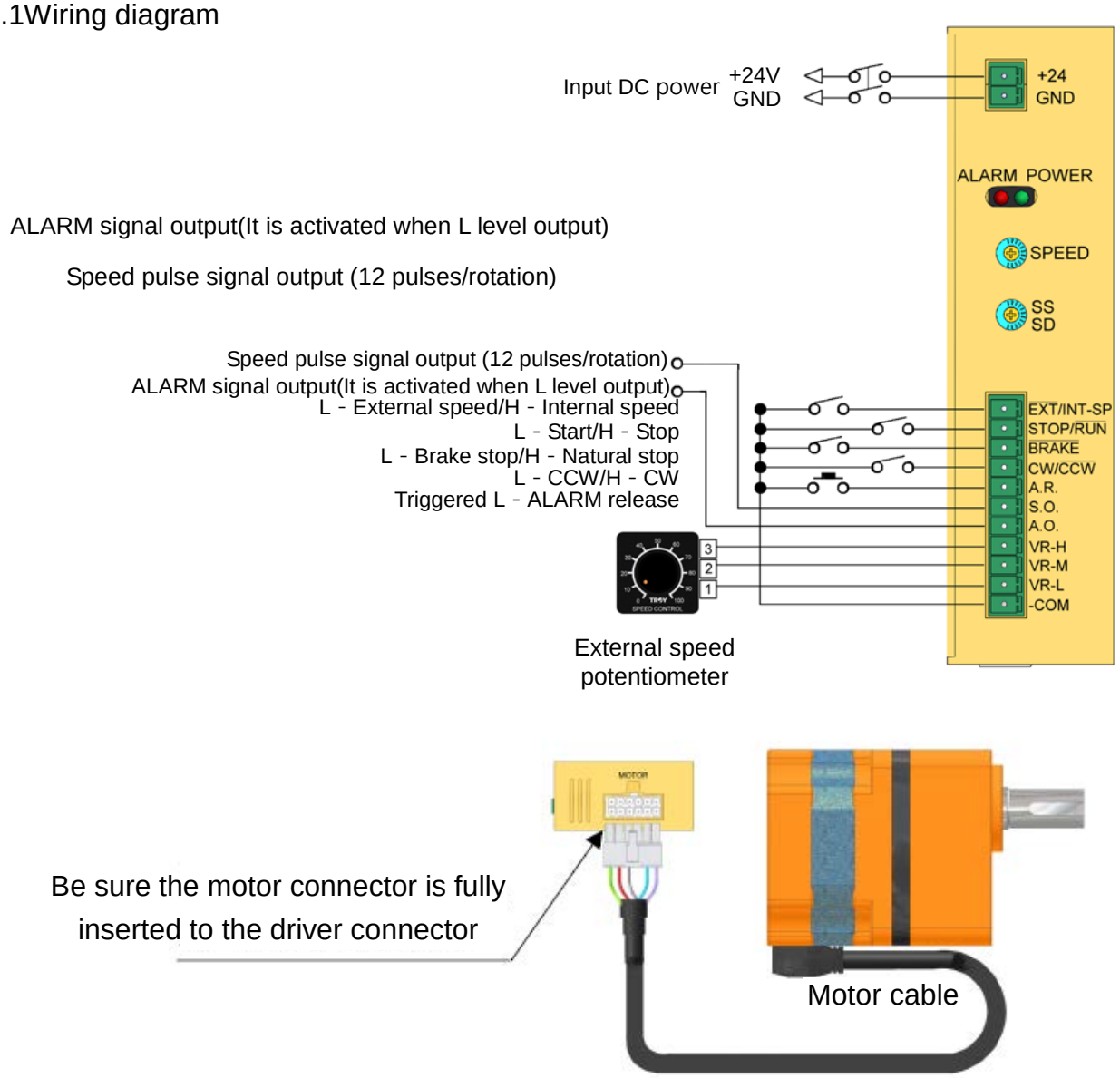
※1.Acceleration/Deceleration time will be different because of load type(ex: Inertia, friction)

※2.「L」indicated contact connect with the 「-COM」,「H」indicated contact no connect （For details please refer to the wiring diagram）

※3.Driver over voltage and wrong connection of power polarities(＋/－),the internal poly switch will open circuit and cut off the power supply to the internal of Driver, the 「POWER」light will not lit up and ALARM signal will not output

4.Wiring and operation

4.1Wiring diagram



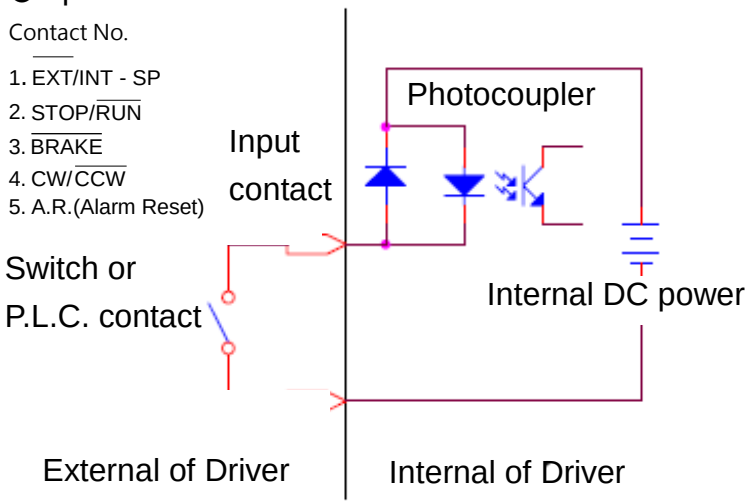
4.2 Noise prevention

Noise interference channel	Prevention
Input /output signal cable	1.Arrange short-distance wiring and the wire should be less than 1m long. Separate the signal wires from the power cords and the spacing should be over 30cm. 2.When using the external velocity regulator (VR) or DC voltage for speed control, please use the provided signal insulated cable.
Motor-Driver connection cable	1.The Motor and the Driver should be connected with cables. In case of long-distance wiring（Within 2m）, please use the optional 「extension cable」to ensure proper wiring.

	2.Separate these wires from the power cords and the spacing should be over 30cm.
Power cable	1.Supply the drive with a separate AC power. Do not share the power supply for those devices with radiating noise sources (e.g. High frequency, ultrasonic, welder or thermo couple, etc.) 2.For the F.G. connection on the Driver, use the type 3 grounding, short-distance, coarser diameter wires. 3.Install a noise suppressor in front of the AC power input to shield off external noise interference.

4.3 Signal input and output

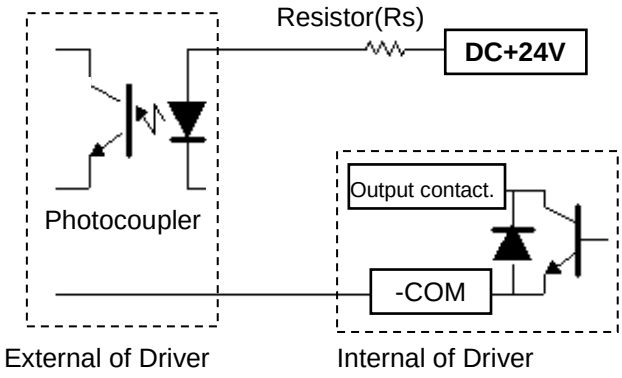
●Input circuit



●Output circuit

Contact No.

6. S.O.(Speed Out)
7. A.O.(Alarm Out)



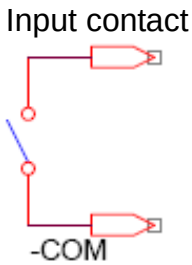
Circuit specs of input surface	Circuit specs of output surface
1.Photocoupler interface circuit and the power supplied by internal DC power 2.「EXT/INT - SP」「STOP/RUN」「BRAKE」「CW/CCW」contact and acted mode in 「N.C. Normally closed switch」or 「Normally open switch」 3.「A.R.」contact acted mode is「Push button switch」triggered time continue more than 10ms after Alarm released then loose the switch	1.Open collector circuit output mode which need external DC power voltage and the voltage value less DC 26V, connected resistor（Rs）and keep current value less 10mA. 「S.O.」「A.O.」signal output via 「Signal output contact」which can measured by voltmeter and the 「external DC voltage」is the level during normal, the 「0V」is the level during action（Please refer to the wiring diagram） External DC voltage: DC+24V Rs=2.4kΩ DC+5V Rs=470Ω

Description of input contact			Description of output contact		
Contact function	Signal condition	Action	Contact function	Signal condition	Action
$\overline{EXT}$/INT - SP	H	Internal speed setting	S.O. (Speed out)	Pulse signal Minus logical Active "L"	Speed signal output and pulse speed is 1.6msec.Motor output 12 pulses every rotation
	L	External speed setting			
STOP/$\overline{RUN}$	H	Stop operation			
	L	Start operation/Slow stop			
$\overline{BRAKE}$	H	Natural stop/Slow stop			
	L	Brake stop	A.O. (Alarm output)	Minus logical Active "L"	Driver output the signal and the ALARM LED(Red) lit up
CW/$\overline{CCW}$	H	Clockwise rotation			
	L	Counterclockwise rotation			
A.R. (Alarm Reset)	H→L→H	Alarm monitor			
		Alarm release			

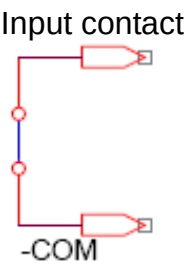
●Definition of contact signal

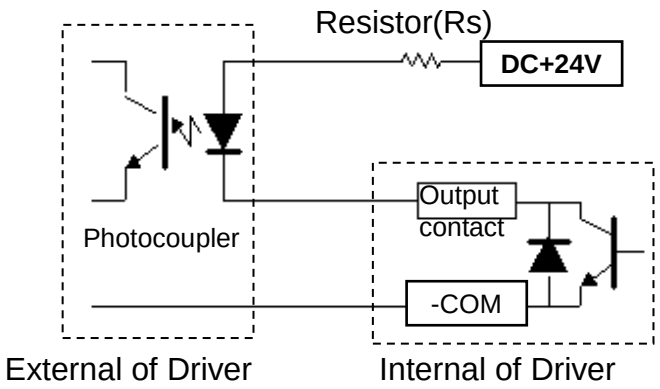
Output is photocoupler interface

When contact is H



When contact is L





4.4Operation mode

●Operation mode setting

Signal input Operation mode	STOP/$\overline{\text{RUN}}$	$\overline{\text{BRAKE}}$	CW/$\overline{\text{CCW}}$	A.R.(Alarm Reset)
Instantaneous clockwise/ Counterclockwise rotation	L	H	H→Instantaneous clockwise rotation L→Instantaneous counterclockwise rotation	H
Brake stop	L	L	H or L	H
Natural stop	L	H	H or L	H
Natural stop then start or slow start	L→H	H	H or L	H
Natural stop then start or slow start	H→L	H	H or L	H
ALARM release	H	H	H or L	H→L→H 「L」continued 10ms

「＊」indicates Acceleration/Deceleration time potentiometer，default value is「0」

Cautions:

1.A.R.(Alarm Reset)signal：When Motor operated please maintain at「H」to make sure the 「Alarm monitor 」circuit of internal Driver operated normal.

If maintain at「L」and Driver has Alarm condition, the protection functions can not work.

A.O.(Alarm Output) can not output the signal which will cause the Driver damage easily so please pay attention to edit the control procedure

2.「A.O.」signal output with ALARM led lit up and return the「STOP/$\overline{\text{RUN}}$」to 「H」which can avoid the unexpected start operation during ALARM release

3.Please do not control the Motor start/stop operation by 「Power SW」and Motor will start operation while power is turn on. But it will occur the surge current and cause the Driver damage easily

4.5 Alarm protection

The protection function activated when Motor over load/over heat/over voltage/low voltage/cable broken and Motor stop, the 「ALARM」LED(red) lit up at the same time.「A.O.」output contact will output 「H」level and change to the 「L」level

Alarm condition	Description
Motor over load	Activated when a load exceeding the rated torque is applied to the Motor for 7 sec
Low voltage	During Motor operation, DC power voltage input to the Driver which is lower 20% of DC 24V
Cable broken	Motor cable was broken
External power over voltage	1.The protection function will be triggered when the Motor operates with loads exceeding the permissible load inertia, or when the Motor is used in up and down vertical movements. 2.During Motor operation, the DC power voltage which input to the Driver is over 25% of DC24V and internal fuse activated auto current off protection,「POWER」led will extinguished
Power wrong connection of polarities（+/－）	When the polarities of DC power voltage（+/－）is wrong connection, internal fuse activated auto current off protection,「POWER」led will extinguished

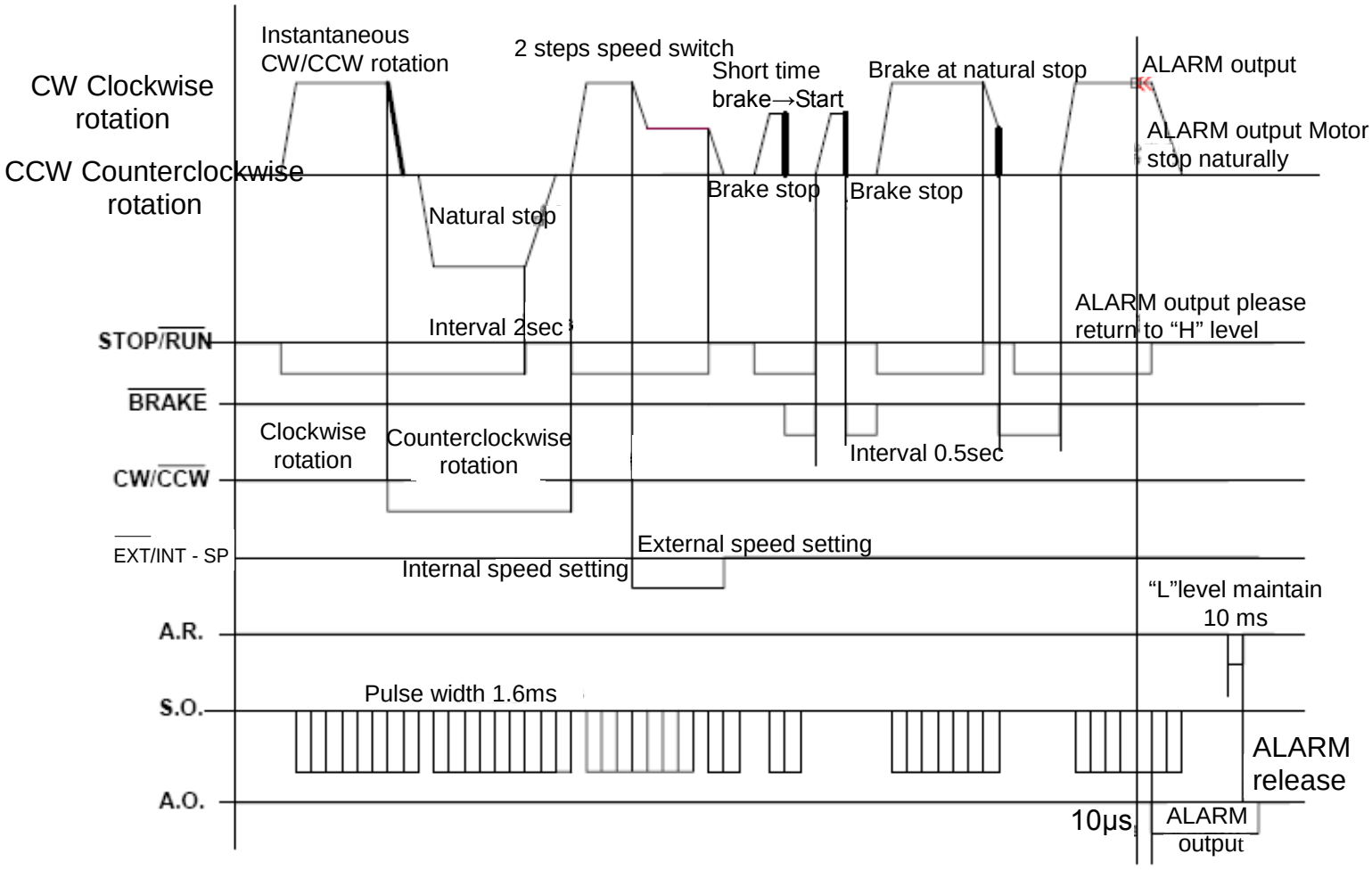
Note:

If there is any ALARM conditions during Motor running, please turn the Driver's「POWER SW」OFF, then check the wiring ,load and power voltage. After the ALARM conditions released then electrify and 「ALARM」led extinguished. If the 「ALARM」led light up continued please contact with our local seller and ask for solution.

※「ALARM」release：(1)「A.R.」input contact keep at the「L」condition 10ms then back to the「H」condition.
(2)Please turn the「POWER SW」OFF more than 5sec then input the power

※Over voltage/ power wrong connection of polarities（+/－）：Please check power voltage specs and wiring the turn the Driver's 「POWER SW」off then input the power. At this moment「POWER」led will lit up which means Driver back to the normal condition

4.6 Driver operation control timing chart



4.7 Connection of Motor and DC power

●Connecting the Motor

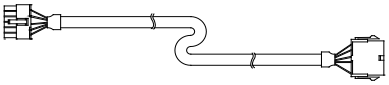
The Motor is connected to the Driver using the connectors provided. Be sure the Motor connector is fully inserted to the Driver connector. Please turn the 「POWER SW」OFF while connecting which avoid the improper connection to cause the Driver damaged.

The cable can be extended to a maximum of 10m using an extension cable (Sold separately).Please choose the suitable extension cable while ordering.

The total length from Motor to Driver＝Motor lead length 60 cm+Extension cable length

※Please select the suitable extension cable while ordering

Total length of Motor to Driver＝Motor cable length 60cm＋extension cable length

Model of extension cable	Length(m)	Extension cable
CB-010	1	
CB-020	2	

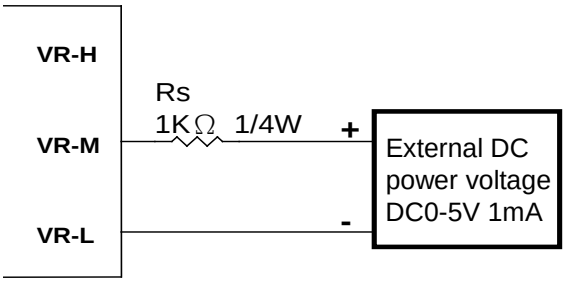
※Actual cable length=Required length+10cm

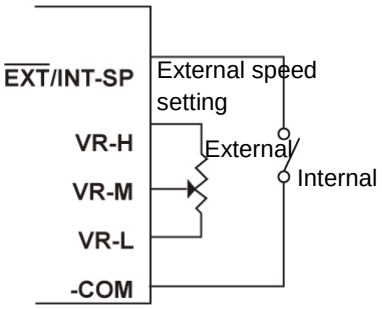
※DC power connection

The CE and UL certified terminal board shall be used for the power input. When connecting the Driver, fix the power supply wire at the terminal (3-pin accessory) and then insert the terminal into the power terminal jack on the Driver. Use **AWG18** power source cable (in profile over 0.75mm^2).

4.8 Speed setting mode

●Speed controlled by external DC voltage





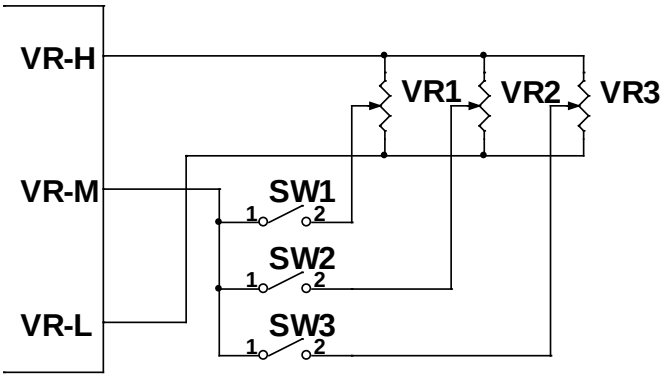
Note:

External DC power output must have to connect Rs resistor 1kΩ 1/4W in series.

Please using the output-insulating DC power supply with ∞ output impedance.

External speed potentiometer(VR)→Model: DBVR(20kΩ Variable resistor)

●Multi-speed control



3-step speed switching control			
SW3	SW2	SW1	Resistance value
OFF	OFF	ON	VR1
OFF	ON	OFF	VR2
ON	OFF	OFF	VR3

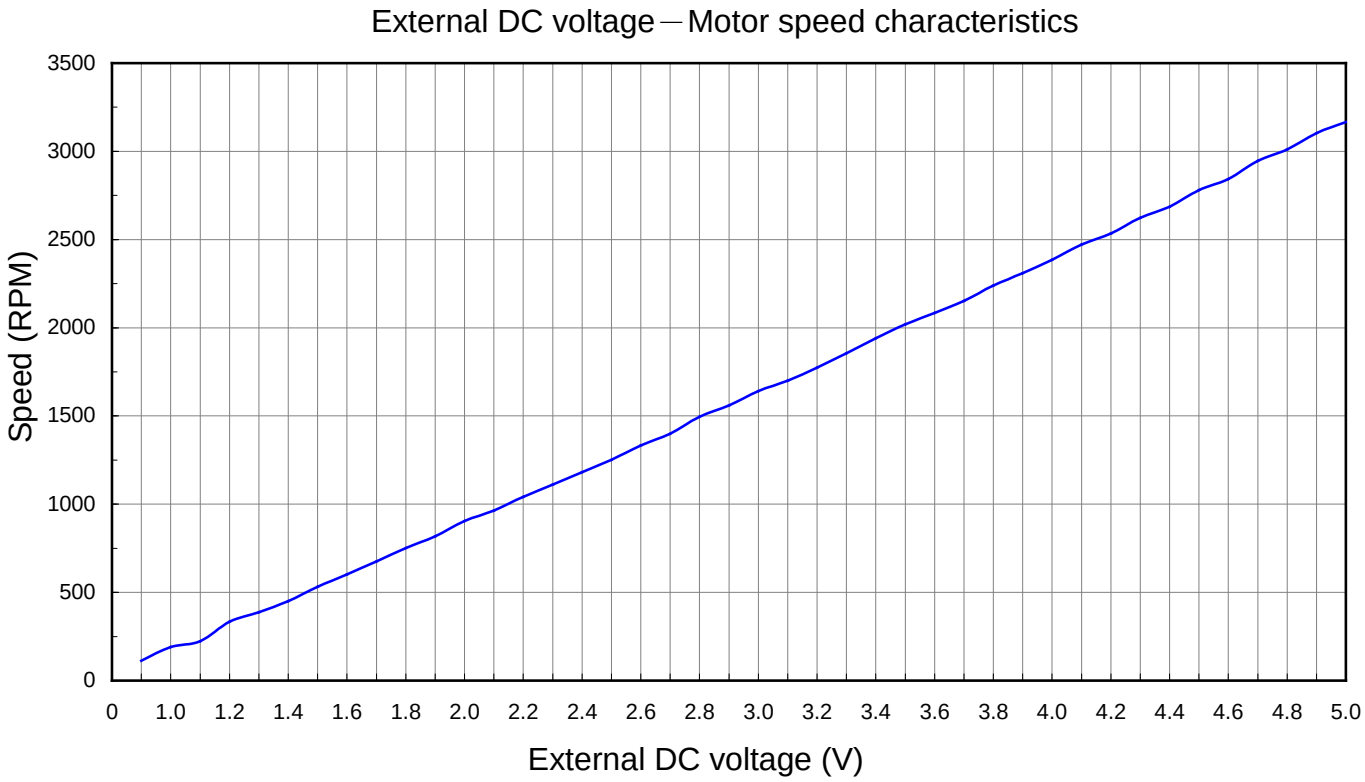
Note:

1.It is recommended to use 20KΩvariable resistor for VR1, VR2 and VR3 (But do not below 10KΩ).

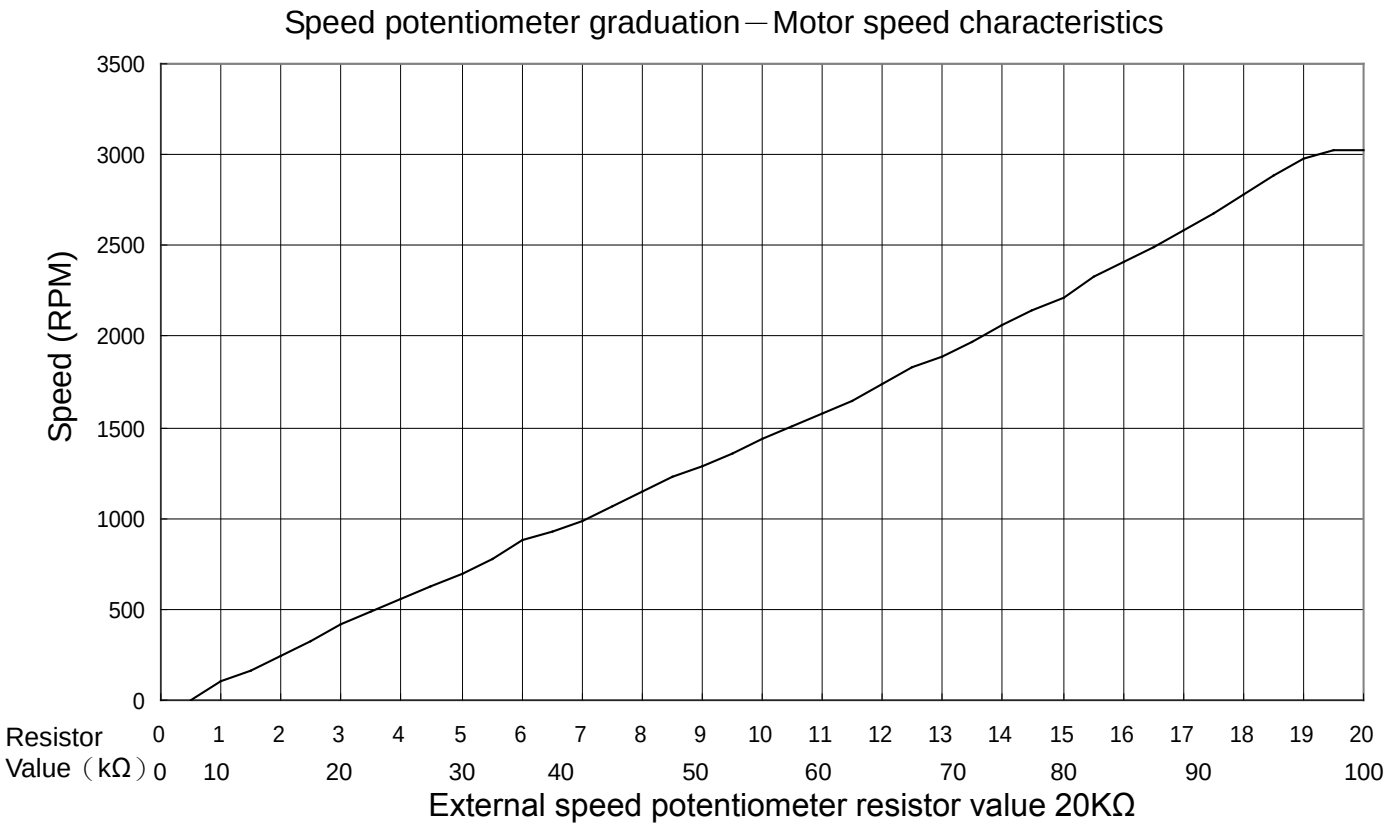
2.The higher the resistance value is, the higher the voltage and the faster the speed.

3.If there required over 3-step speed control, please contact our customer service depart.

●External DC voltage－Motor speed characteristics



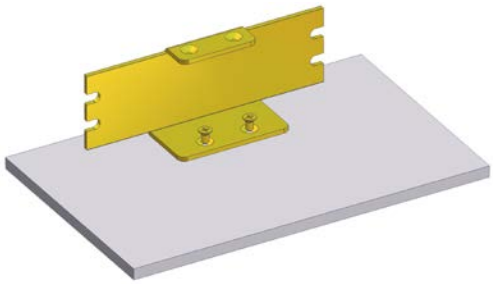
●Speed potentiometer graduation



5.Installation of Driver

5.1Installation

1.Horizontal installation



Plate

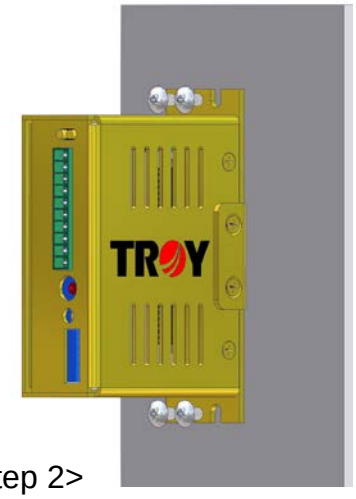
＜Step 1＞
Locking the mounting bracket on the plate by using 2screws

Plate

＜Step 2＞
Fit the Driver into the groove of mounting plate. Mounted with 2 screws

2.Vertical installation

<Step 1＞
Remove the middle 2 screws of Driver. Vertically fit the driver into the groove of the mounting base. Then re-mount the 2 removed screws



<Step 2>
Lock the mounting base onto the mounting plate by using 4 screws

Note:

※The real dimension please refer to the P12.－Dimension

5.2Installation condition

Install and use the Driver/Motor/ Gearhead in the environment described as the following:

※Indoor (without direct sun light exposure) or the place that is well ventilated and easy for heat radiation. Don't not expose to the sunlight directly.

※Ambient temperature:

Driver 0 ℃+40 (Avoid freezing).Motor 0℃～+50 (Avoid freezing)

※Ambient humidity: Below 85% (Avoid condensation).

※The place that will not be affected by water, oil, corrosive and flammable gas or dust.

※The place that will not affected by continuous vibration.

（1）When the Driver is installed in an enclosed place or a place where a heating source exists nearby, please watch out for the temperature rise of the Driver. It is recommended to use a fan for forced cooling and maintaining the temperature of the Driver at below 40^0C so as to avoid excessive temperature inside the Driver and activation of the overheat protection function.

（2）Keep conductive objects (cutting powders, bolts and electrical wire chips, etc.) from getting into the Driver.

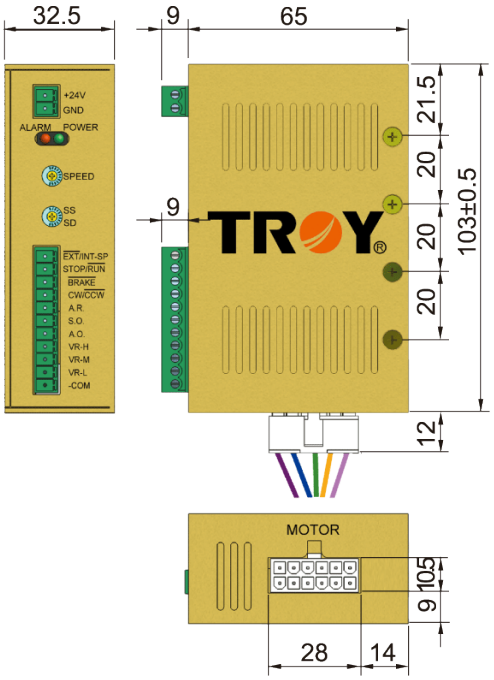
（3）Installing multiple Drivers:

When you install and anchor multiple drives together, be sure to keep a spacing over 20mm between each Driver and the Driver should have a spacing over 25mm from other peripherals .

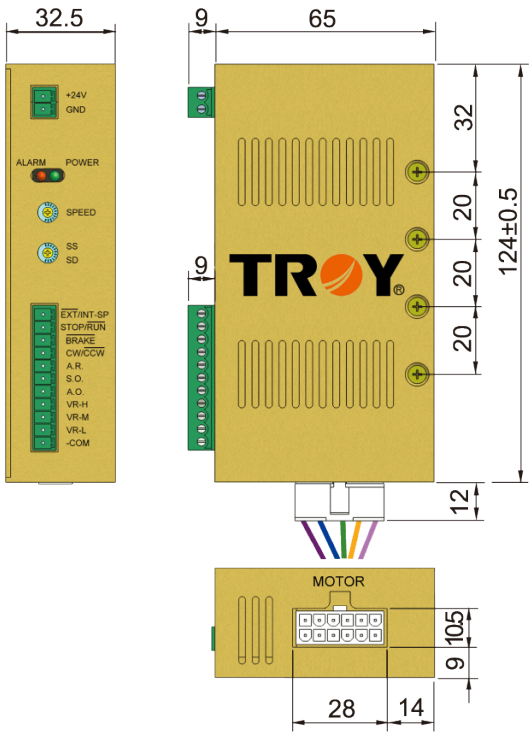
6.Dimension

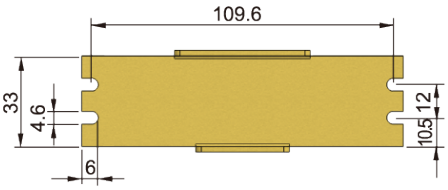
Unit:mm

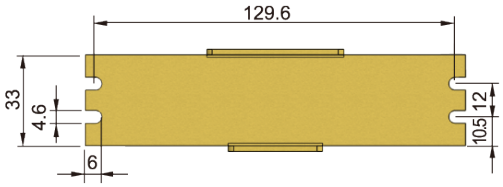
Model:DBD020-D/DBD040-D Weight:210g

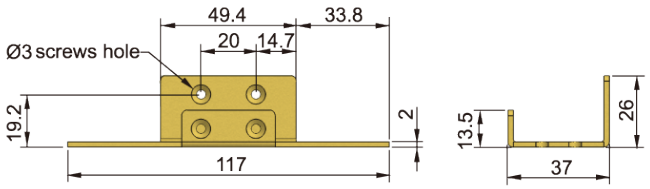


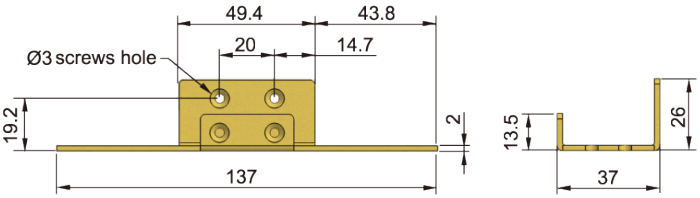
Model:DBD060-D/DBD100-D Weight:290g

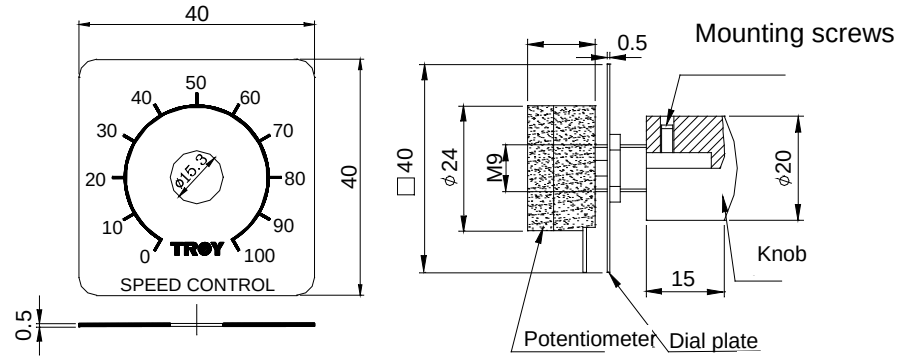












Speed potentiometer panel diagram

＊For environment protection, paper saving and resources preservation, please download the user's manual directly from TROY website：http:// www.troy.com.tw

※ **Environmental Responsibility**

- TROY is always committed to environment protection. All packaging material is recyclable and reusable.
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----------Protect the green earth with your care and commitment----------

※ The product is subject to design modification for performance improvement without prior notice. For more details, please contact with your local seller.

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